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Spectroscopic Observations of the Motion of Stars in the Line of Sight made at the Temple Observatory, Rugby. By Geo. M. Seabroke.

The following observations are intended to be in continuation of similar ones communicated to the Society in the years 1879 and 1887; and in vol. xlvii. page 93 of the *Monthly Notices* will be found a description of the telescope and spectroscope used prior to the commencement of the present year.

Those observations recorded as made with two prisms are made with a new spectroscope constructed by me some months ago, and consisting of a collimator of 18 inches focal length and 1½ inch in diameter, a similar lens in the observing telescope, and two prisms of an angle of 45°. The focal length of the eye-piece is about ⅓ inch.

The measures were made by a pointer of tinfoil, set edgewise to the line of sight, alternately on the star line and line from the hydrogen tube or magnesium wire respectively, and recording the distance moved by the pointer by readings of the micrometer screw.

The pointer is illuminated by light reflected upon it from a small reflector close to the eye.

Owing to my want of practice with a pointer of this form, and certain wants of adjustment in illuminating the pointer equally at both edges, my early readings vary *inter se*, and the observations are therefore of little value; but of late the measures are much more accordant. By reducing the number of prisms in the new instrument as compared with the old one, the illumination of the spectrum is much increased, while the power of comparison is retained by increase of focal length and diameter of the collimator.

A marked excess of − motion over + is to be remarked; and although I can give no reason for any systematic error in the former direction, I feel that the observations hereafter recorded should be received with caution.

Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			Andromedæ.		
5	F	4	+32·6	87·084	
5	F	3	−46·7	·928	
5	F	4	−29	·955	
5	F	3	−68·8	·958	
2	F	2	−56·2	88·972	
2	F	4	−30·5	89·825	
			γ Pegasi.		
5	F	4	−51·2	87·903	
5	F	3	−23·1	·955	

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Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800 +	Remarks.
			β Andromedæ.		
5	F	2	+ 13·7	87·084	
5	F	4	− 37·9	·110	
5	F	3	− 35·5	·120	
5	F	3	− 16·3	·125	
			β Arietis.		
5	F	3	− 46·1	87·928	
5	F	4	− 62·6	88·076	
5	F	1	− 34·5	·024	
			γ Andromedæ.		
5	F	3	− 45·2	87·084	
5	F	4	− 38·9	·110	
5	F	3	− 27·2	·125	
5	F	2	− 38·7	88·172	
			α Arietis.		
5	F	4	− 47·9	87·084	
5	F	2	− 34·5	·104	
5	F	4	− 36·7	·110	
5	F	3	− 32	·120	
5	F	2	− 30·9	·928	
5	F	3	− 20·5	88 076	
			Algol.		
5	F	4	− 28·2	87 125	
5	F	5	− 45·2	150	
5	F	3	− 51·1	158	
5	F	2	− 39·4	·167	
5	F	4	− 22·5	928	
5	F	3	− 31·2	88 076	
5	F	5	− 54·6	172	
5	F	3	− 47.5	·197	
2	F	3	− 88·5	89·123	
			α Persei.		
5	F	4	− 35·4	87·110	
5	F	3	− 44·7	·120	
5	F	6	− 37·7	88·172	
5	F	1	− 33·0	·197	

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Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			Aldebaran.		
5	F	3	+ 8·7	87·158	
5	F	3	+ 7·7	88·172	
5	F	1	− 7·3	·197	
			α Aurigæ.		
5	F	3	−59·4	87·120	
5	F	5	−36	·125	
5	F	1	−18·3	·150	
5	F	2	−12·5	·158	
5	F	4	− 3	·287	
5	F	4	−22	·298	
5	F	5	−13	88·172	
5	F	2	+ 8·5	·314	
5	F	4	+ 5	·328	
5	F	4	+12	·334	
2	F	5	−41·3	89·123	
5	F	3	+13·7	·227	
5	F	4	−39·8	·238	
			Rigel.		
5	F	2	+21·6	87·084	
5	F	4	+ 0·9	·110	
5	F	2	+ 2·3	·104	
5	F	4	+ 2 5	88·197	
5	F	2	− 3·5	·216	
			γ Orionis.		
5	F	3	−24	87·158	
5	F	3	− 8·5	88·197	
			β Aurigæ.		
5	F	4	−42·7	87 287	Line diffuse.
5	F	4	−55·3	88·328	„
5	F	2	−41·2	·334	
5	F	4	−54·3	·347	
5	F	3	−62	89 227	
			β Tauri.		
5	F	3	+ 5·8	87·287	
5	F	4	+21·1	·298	

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Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			Sirius.		
5	F	3	− 44·1	87·110	
5	F	2	− 22·5	125	
5	F	4	− 31·3	150	
5	F	3	− 47·7	158	
5	F	4	− 19·5	88·172	
5	F	2	− 38·7	199	
5	F	4	− 49·8	216	
2	F	6	−174·6	89·104	New spectroscope, obviously in error.
2	F	...	−123·7	·123	
			Castor.		
5	F	3	−14	87·287	
5	F	4	−51·7	·350	
5	F	3	−49·4	·353	
5	F	3	−48·6	88·314	
5	F	4	−25·9	·328	
5	F	2	− 4·2	·334	
5	F	4	+12·7	·347	
2	F	3	− 14·8	89·227	New spectroscope; error.
			Procyon.		
5	F	3	−10·8	87·287	
5	F	5	−21·6	·298	
5	F	3	−37·5	·350	
			Pollux.		
5	F	2	−18·2	87·353	
5	F	3	+ 2·9	88·314	
5	F	2	−48·6	·328	
5	F	1	−22·8	·334	
5	F	4	−33·4	·347	
			η Leonis.		
5	F	2	0	88·334	

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Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800 +	Remarks.
			α Leonis.		
5	F	7	−21·5	87·350	
5	F	6	−47·2	·353	
5	F	4	+22·9	·374	
5	F	4	− 7·0	88·325	
5	F	5	−68·5	·328	
5	F	4	−58·3	89·232	
5	F	4	−36·4	·342	
5	F	2	−27	·382	
5	F	4	−40·6	·383	
			γ Leonis.		
5	F	1	− 0·3	87·350	Line barely visible.
5	F	4	−15·8	88·394	„ „
			α Ursæ Majoris.		
5	F	5	+ 5·5		
5	F	4	− 4·1		
			γ Ursæ Majoris.		
5	F	4	−26·6	87·520	
5	F	4	−19·3	·550	
5	F	4	−31·5	89·386	
2	F	4	85·5	·388	Line badly defined.
2	F	3	−75·8	·427	New spectroscope; probably in error.
			β Ursæ Majoris.		
5	F	3	− 9·5	87·52	
5	F	4	+ 3·0	·55	
5	F	3	− 45·8	89·386	
5	F	5	− 64·7	·388	
2	F	4	− 39	·427	
2	F	4	− 82	·446	
			δ Leonis.		
5	F	3	− 24	88·394	Line diffuse.
5	F	4	−107	89·380	„
5	F	4	− 74·6	·383	„
			θ Leonis.		
5	F	4	− 24	...	Line faint.
5	F	3	− 35	...	„
5	F	4	+ 12·7	...	

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Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			β Leonis.		
5	F	5	− 30·8	87·443	Line very diffuse.
5	F	5	− 19·3	88·394	
5	F	4	− 83·5	89·380	
5	F	4	− 32·2	·383	
			δ Ursæ Majoris.		
5	F	3	− 33·9	87·520	
5	F	4	− 10·8	·550	
2	F	2	− 33·0	89·418	
			ε Ursæ Majoris.		
5	F	4	− 15·3	87·484	
5	F	4	− 19·8	·520	
5	F	3	− 19·7	·580	
5	F	4	− 55	89·386	
5	F	4	− 95·5	·388	
2	F	3	− 40·2	·418	
2	F	4	− 83·2	·465	
			ζ Ursæ Majoris.		
5	F	4	− 11·6	87·550	
5	F	5	− 42·2	·580	
5	F	3	− 61·3	89·386	
2	F	5	− 21	·465	
			α Virginis.		
5	F	4	− 17·1	87·353	
5	F	4	− 0·5	·374	
5	F	7	− 51·9	·443	
5	F	3	− 4·2	89·383	
			η Ursæ Majoris.		
5	F	3	− 28·5	87·457	
5	F	3	+ 2·7	·550	
5	F	4	+ 1·3	·580	
5	F	2	− 28·9	·640	
5	F	2	− 32·5	89·383	
2	F	4	− 65·5	·418	New spectroscope; doubtful.
2	F	5	− 7·7	·468	,,

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Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			Arcturus.		
5	b_1	5	+ 7·1	87·353	
5	b_1	6	+ 8·1	·374	
5	b_1	4	− 44·3	·434	
5	b_1	4	− 28·1	·443	
5	b_1	2	− 23·1	·451	
5	F	1	− 35·0	88·380	
			α Coronæ Borealis.		
5	F	4	− 11·3	87·550	
5	F	5	− 57·4	·640	
5	F	2	− 22·2	·680	
5	F	4	− 35·7	·750	
5	F	1	− 45·0	89·380	
2	F	2	− 56·5	·427	
2	F	5	− 59·3	·506	
2	F	4	+ 9·0	·544	
			α Ophiuchi.		
5	F	2	− 20·8		
5	F	3	− 25·7		
5	F	4	+ 9·0		
2	F	4	+ 23·0	...	New spectroscope; doubtful.
			Vega.		
5	F	6	+ 24·0	87·740	
5	F	5	− 64·1	·770	
5	F	5	− 53·1	·791	
5	F	3	− 29·7	·802	
5	F	3	− 56·0	·810	
5	F	5	− 67·1	·829	
5	F	4	− 21·2	88·794	
5	F	3	− 33·7	·796	
5	F	4	− 43·0	·804	
2	F	5	− 39·6	89·506	
2	F	4	− 55·0	·544	
2	F	4	− 63·3	·654	
2	F	4	− 50·1	·657	
2	F	4	− 73·2	·659	
2	F	3	− 46·5	·681	

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Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			γ Lyræ.		
5	F	5	+ 6·3	87·791	
5	F	3	− 33·4	·802	
5	F	3	− 27·5	·810	
5	F	2	− 27·5	·829	
5	F	2	− 14·8	88·796	
5	F	3	− 72·5	·804	
			ζ Aquilæ.		
5	F	3	− 27·9	87·791	
5	F	4	− 15·5	·802	
5	F	4	− 51·9	·810	
			γ Aquilæ.		
5	F	3	− 24·6	87·802	
5	F	4	+ 4·7	·810	
			δ Cygni.		
5	F	4	+ 14	87·791	
5	F	4	− 29·7	·802	
5	F	4	− 25·0	·810	
5	F	4	− 30·4	·903	
5	F	3	− 28·1	88·796	
2	F	3	− 53·5	89·679	New spectroscope; doubtful.
2	F	5	− 49·5	·690	„
			Altair.		
5	F	4	− 23·5	87·791	
5	F	4	− 28·3	·810	
5	F	3	− 34·5	88·794	
5	F	4	− 39·5	·796	
5	F	2	− 82·7	·804	
2	F	4	+ 2·5	89·796	
2	F	4	− 34·5	·659	
			θ Aquilæ.		
3	F	8	+ 34·5	86·75	

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Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			γ Cygni.		
5	F	4	− 22·0	86·96	
5	F	4	− 31·4	·96	
5	F	4	− 47·1	87·791	
5	F	3	− 24·2	·802	
5	F	4	− 37·2	·810	
2	F	3	− 21·0	89·777	
2	F	4	− 34·5	·796	
			α Cygni.		
3	F	4	− 17·0	86·93	
5	F	4	− 36·5	·96	
5	F	4	− 55·3	·96	
5	F	3	+ 21·1	87·791	
5	F	4	− 28·3	·870	
5	F	4	− 25·3	·903	
5	F	3	− 20·4	88·794	
5	F	2	− 58·0	·796	
2	F	5	− 16·0	89·777	New spectroscope; doubtful.
2	F	4	+ 7·0	·796	„
			ε Cygni.		
3	F	2	− 27·0	86·93	
5	F	4	− 33·9	87·810	
5	F	2	− 16·3	·955	
2	F	3	− 39·0	89·796	
			ε Pegasi.		
5	F	4	+ 10·3	87·902	
5	F	4	+ 6·7	·955	
5	F	4	+ 10·2	·958	
			η Pegasi.		
3	F	2	− 17·7	86·93	
			α Pegasi.		
5	F	2	− 26·3	86·96	
5	F	5	− 27·8	87·870	
5	F	4	− 40·5	·903	
5	F	3	− 38·0	·950	
5	F	4	− 17·0	·955	
2	F	3	− 47·0	89·177	
2	F	4	+ 10·0	·835	
			β Pegasi.		
5	b_1	2	+ 41·1	86·96	
5	b_1	2	+ 16·6	·96	

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On the Orbit of Struve 228. By J. E. Gore.

Recent measures show that this binary star has described about 120° of its apparent orbit since its discovery by Struve in 1829. I have computed the orbit by Professor Glasenapp's method, combined with Kowalsky's equations, and find the following provisional elements:—

Elements of Σ 228.

$P = 88{\cdot}73$ years	$\Omega = 84^\circ\ 49'$
$T = 1906{\cdot}03$	$\lambda = 51^\circ\ 36'$
$e = 0{\cdot}5311$	$a = 0''{\cdot}98$
$i = 70^\circ\ 59'$	$\mu = +4^\circ{\cdot}057$

P and T were computed by the formulæ:—

$$T = \frac{t'+t}{2} - \frac{M'+M}{M'-M} \cdot \frac{t'-t}{2}$$

$$P = \frac{360^\circ}{\mu}\ ; \quad \mu = \frac{M'-M}{t'-t}$$

where M and M′ are the mean anomalies, computed from the geometrical elements, for the epochs t and t' and the corresponding values of θ, derived from the earlier and later observations.

The following is a comparison between the recorded measures and the positions computed from the above elements. The observed position-angles have been corrected for the effect of precession to 1880·0:—

Epoch.	Observer.	θ_o	θ_c	$\theta_o - \theta_c$	ρ_o	ρ_c	$\rho_o - \rho_c$
		°	°	°	″	″	″
1829·16	Struve	264·21	258·47	+ 5·74	1·08	0·83	+0·25
1831·75	,,	262·41	262·50	− 0·09	1·22	0·96	+0·26
1832·02	,,	259·00	262·80	− 3·80	1·14	0·99	+0·15
1832·20	,,	263·50	263·00	+ 0·50	0·93	1·05	−0·12
1832·21	,,	262·60	263·01	− 0·41	1·03	1·05	−0·02
1841·94	O. Struve	274·88	271·36	+ 3·52	1·32	1·20	+0·12
1852·19	Mädler	280·32	278·80	+ 1·52	1·11	1·18	−0·07
1856·76	Dembowski	281·12	282·48	− 1·36	1·0	1·12	−0·12
1857·21	Mädler	284·23	282·87	+ 1·36	0·9	1·11	−0·21
1862·96	Dembowski	286·57	288·57	− 2·00	0·9	0·98	−0·08
1866·07	,,	291·66	292·45	− 0·79	0·947	0·89	+0·057
1869·48	Dunér	299·54	297·64	+ 1·90	0·71	0·78	−0·07
1870·18	O. Struve	299·64	298·93	+ 0·71	0·86	0·76	+0·10
1873·81	Dembowski	304·40	306·80	− 2·40	0·64	0·65	−0·01
1874·94	Gledhill	307·22	309·83	− 2·61	0·6	0·61	−0·01